Service Manual

for seca 717A, 717 Japan, 757

Variants:
7177021008
7177021098
7177021248
7577021004
7577021094

Service Manual Number:

17-05-01-249-f

Valid as of: 30.08.00

Valid until:

Description:

High resolution approved baby scale with integrated LED-display

Content:

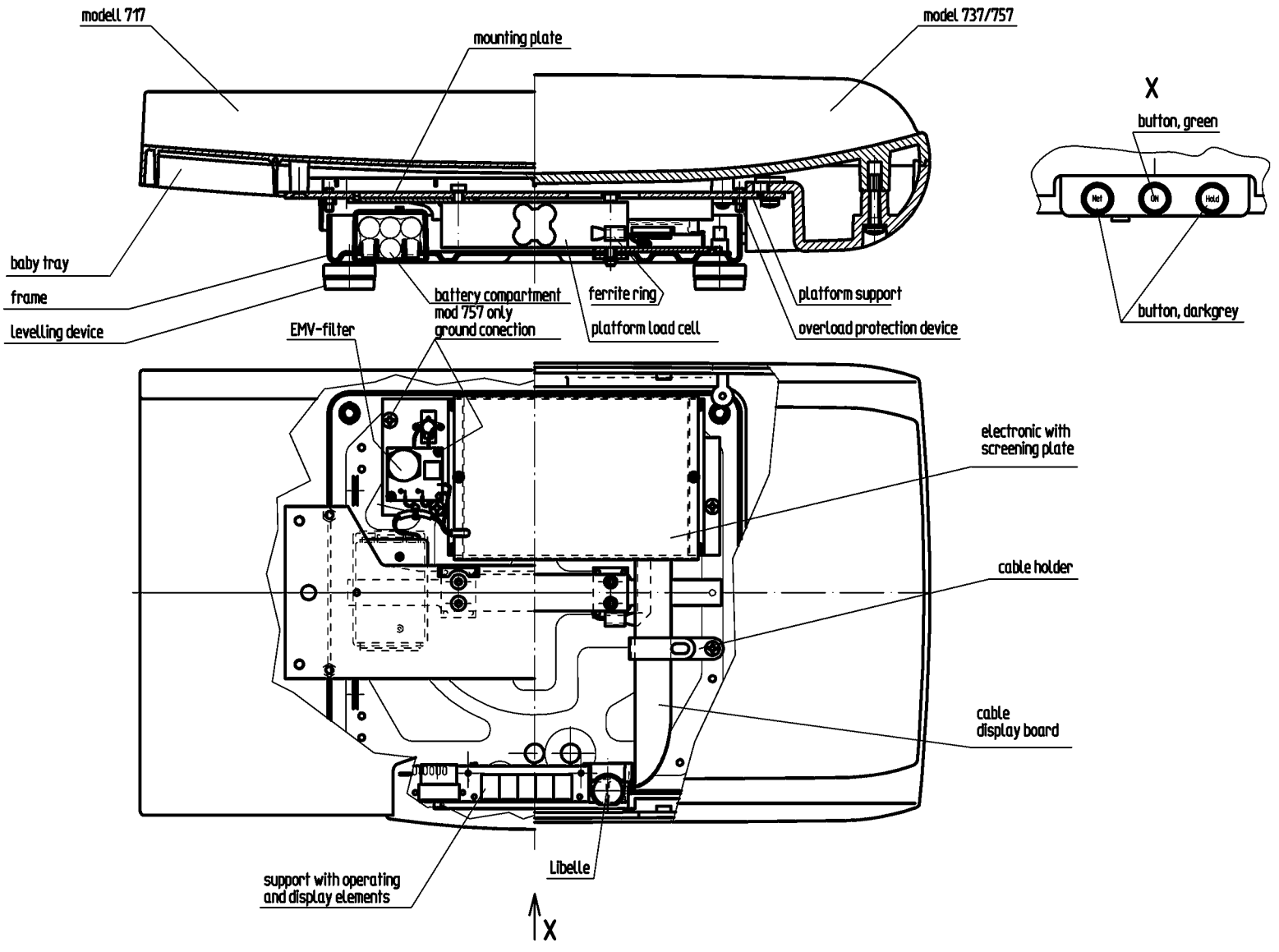
Operation	17-10-07-314	c
Operation	17-10-07-345	b
Operation	17-10-07-354	
Function diagram	25-01-02-446	d
Function diagram	25-01-02-503	
Electronics	25-01-02-467	e
Block diagram electronics	08-09-01-267	c
Description of faults	30-34-00-437	g
Replacement	30-34-00-483	e
Calibration	30-34-00-609	
spare parts	30-34-00-550	f

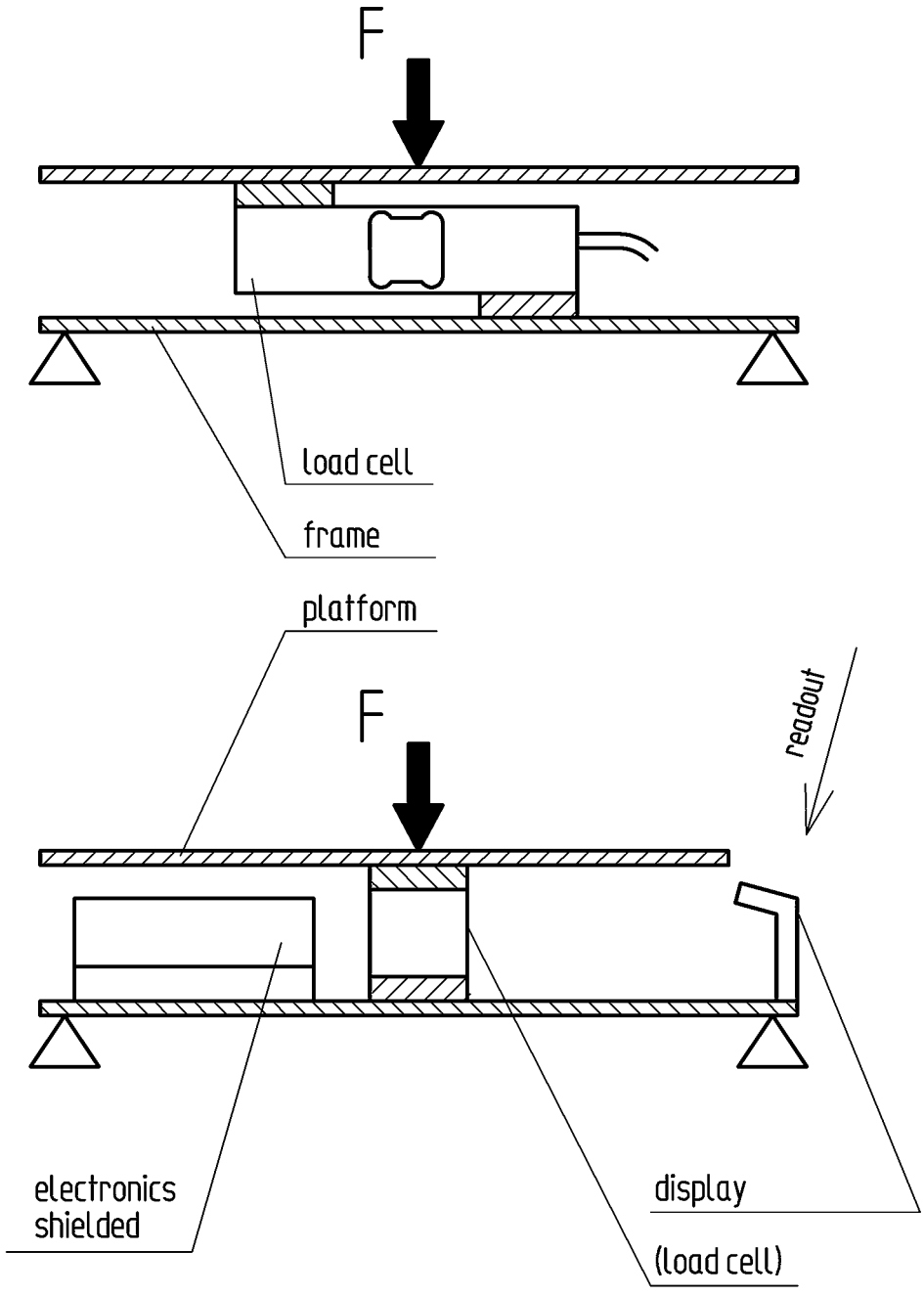
Benennung:

Function diagram 717/737/757

Nr.:

25-01-02-446D





Alle Rechte an und aus diesen Unterlagen verbleiben Vogel & Halke.

Datum/Name:								
Änd.Mitteil.:								
Index:								
seca HAMBURG		Datum:	05.02.98	Eingeführt mit	Datum/Name:			
		Gezeichnet:	Sievers	ÄM-Nr.	Änd.Mitteil.:			
		Geprüft:		Datum:	Index:			
Maßstab:	Werkstoff:	Benennung:			Nr.:			
		Function diagram			25-01-02-503			

Associated circuit diagrams:
1. A/D converter circuit diagram 08-01-21-321
2. Microprocessor circuit diagram 08-01-21-322
3. Display unit circuit diagram 08-01-21-323
4. Switched-mode power supply circuit diagram 08-01-21-354

Measuring element
A platform load cell is used as the force measuring element. 4 wire resistance strain gauges are attached to its surface at suitable points which are connected in a bridge circuit. When a load is applied, the spring body is deformed in such a way that the two resistors forming a half bridge are extended and compressed. This causes the resistance to be increased or reduced so that the bridge is detuned, causing a change in the output signal:

$$U_a = k \cdot U_S \cdot F \qquad U_a \propto F$$

In order to ensure a higher signal yield for the seca 717, the measuring element and the A/D converter are supplied with 10V; usually, a 5V power supply is provided.

Analog to digital converter
The A/C converter directly processes the small output signal of the strain gauge sensor. It functions according to the principle of signal-dependent pulse-width modulation. All digital functions of the A/D converter are implemented via software in a microcomputer. The reference potential of the A/D converter is ≈ U/2, since the positive input of integrator 402 is connected to a bridge output via resistor 506. During a predefined total time T, first the input voltage +Ue is connected to integrator 402 via resistors 507 and 506 and then the reference voltage U/2 with FET switch 600/1,2,13, via resistors 510, 517 (for model 727 only), 602, 604, 511, 512, 513 and 514. The components are selected so that the integrator integrates up during this phase whenever an input voltage is applied until comparator 502 reacts. The response threshold of the comparator is determined by resistors 410 and 411. Resistor 413 causes positive feedback and prevents the comparator oscillating. The microcomputer detects that comparator 502 is triggered and switches FET switch 600/1,2,13 off. The integrator now runs down until time T has expired. The interval between T = 0 and the moment the comparator reacts is a measure for the input voltage Ue.

Trimmer 602 compensates for the local gravitation (GAL value). Trimmer 604 is used to fine-adjust the slope. As the adjustment range for 604 has been deliberately kept small, the slope can be adjusted using the combination 513, 514.

Resistors 508 or 509, which can be used alternatively, are used for coarse adjustment of the zero point. Resistor 412 helps the output stage of amplifier 402 to increase the negative output range.

Resistors 515 or 516 allow characteristic curves to be corrected.

For incubator scale 748 only:
For reasons of electromagnetic compatibility, the analog to digital converter circuit is provided on a separate board. Reducing the analog signal path by mounting the board in the base plate and using interference-suppression capacitors 400, 401, 501, 603 considerably reduce electromagnetic susceptibility.
The 5V supply voltage for the board is fused on the main board with a 100mA fuse to limit the energy on the board in the event of a fault.

Temperature compensation
For temperature compensation of the strain gauge sensor, a fixed-value resistor is connected in parallel with a temperature-dependent resistor. To compensate for the sensitivity's t.c. value, the combination 511,512 is used (NTC). The positive t.c. value of the test value can be compensated for by the combination 405, 406 (PTC).

Zero point, sensitivity and test value are partly interdependent. To determine these values, the modules (electronics + sensor) are measured at 10°C and 40°C (zero point, slope, test value) and the results are entered into a computer. The computer uses a complex computing routine to calculate the optimum temperature compensation.

Microcontroller and display
The central computing and control element is the microcontroller (µC) 520.

It fulfils the following functions:

- Digital A/D conversion
- Calculation of the zero point
- Binary BCD segment conversion
- Display control using multiplex operation
- A/D converter test
- Testing the CPU and the memories (RAM and ROM)
- Overload detection
- Monitoring the supply voltage (digital)
- Automatic zero point monitoring
- Taring function
- Hold function

All functions are implemented via software in the programmed memory (ROM) of the µC.
Sequence of operations

When the start button is pressed, the following steps are executed:

Starting
The µC is started with the reset logics (see below) and the program is executed.

Self-test
A test digit is written into all of the RAM cells in succession, then read out and compared.

The main CPU commands are checked via computer operations to see that they function correctly.

The sum of the digits of those memory values which are important for the weighing result is continuously calculated and checked for correctness.

In the event of fault, "EEEEE" is written to the display.

Zero point determination
After starting, "SECA" is displayed for approx. 1 second. During this period, the zero point is determined. The measured value M_0 obtained is saved and subtracted from the relevant measured values.

For incubator scale 748 only:
After "SECA", "-UP-" flashes in the display. The scale must be relieved by at least 0.5 kg in order that the zero point can be determined. Once the zero point has been determined, a sound is emitted for approx. 1 second which signals that the scale is ready for weighing.

Zero point follow-up
If the current measured value M_i changes only slightly in relation to the zero point value M_0 within a given time (C = 0.5 d/sec), the current measured value is regarded as the zero point ($M_i = M_0$).

Weight calculation
The weight is calculated from the current measured value M_i minus the zero point value M_0, divided by n_e n_e is the internal step count per step displayed.

$$F = \frac{(M_i - M_0)}{n_e}$$

Here $n_e = 10$.

Display
The current weight F is displayed on a 7-segment LED display. The display is controlled via multiplex operation. Consequently, actuation faults affect all segments and are detected immediately.

The µC outputs the processed 7-segment information to the segment port. Via Darlington driver 419 (8 transistors) and resistor network 317 (8 resistors), the cathodes of the LED's are set to 0 V. The shared anodes are connected to + 5V via the relevant digit transistor.

Overload detection
The current measured value M_i is checked with respect to two limit values:

a) Overranging
If $F = F_{max}$ + 9d, "STOP" is displayed.
(d = graduation on the display)

b) Overshooting the limit
If $F = F_{lim}$ (ca. F_{max} + 20 %), "EEEEE" is displayed.

C) A/D converter limit values
If the bottom or upper limit of the A/D converter is overshot, "EEEEE" is displayed.

Range switch-over for model 717
By pressing the weighing range switch-over button, where normally the tare button is fitted, the scale can be switched over between weighing range 1 and 2:
Weighing range 1: 15kg / 5g
Weighing range 2: 6kg / 2g

Hold and tare function for model 727
The Hold/Tare button has two functions.
Tare range: up to 0.4 kg
Hold range: from 0.4 kg

Taring function for models 737 and 757
The taring function is activated by pressing the tare button.

Hold function for models 717,737,748 and 757
The hold function is activated by pressing the hold button.

Taring
If the taring function is activated, this is detected by the µC, tare indicator 27 on the display board is switched on and the weight on the scale is tared off.

The zero point M_0 is subtracted from the measured value M_i and the result is saved as M_t. The weight now results from:

$$F = \frac{(M_i - M_0 - M_t)}{n_e}$$

Zero follow-up and overload detection continue to operate as usual, whereas the measuring range is overshot if:

$$F = F_{\max} + 1d - \frac{M_t}{n_e}$$

If measured value M_i is smaller than the zero point M_0 by the value M_t, the taring function is cancelled again.

The value M_t is added again to the zero point and tare indicator 27 is switched off.

Hold operation
If the hold function is activated, the weight is retained on display as soon as the value has stabilized, until the hold function is activated the next time.

Monitoring the supply voltage
A monitoring circuit for the supply voltage is connected to pin 14 of the µC, which detects if the operating voltage is too low. If this pin is at 0-potential, the µC interrupts the normal measuring cycle and writes "bAtt" into the display. If the scale is operated on rechargeable batteries, the electronics are switched off after a few seconds via pin 8 of the µC in order to prevent exhaustive discharge.

Switch-on time
The switch-on time is determined by the software as standard. Continuous operation can be achieved by soldering in jumper 618.

Power supply unit detection
If a power supply unit is connected to the scale, transistor 109 is switched through via the battery charging circuit (see below). This sets pin 33 of the micro-controller to 0V and the switch-on time is extended in accordance with the software setting.

Power supply
The circuit has the following special features:

- Reliable function over a large input voltage range from 6 – 15 V at a controlled output voltage of 5V or 10V.
- Low power loss

Reset circuit
By connecting a power supply unit, a positive pulse is issued via high-pass filters 116 and 117 and via diode 118. The same happens when the start button is pressed (via 113, 114 and 115). Resistor 112 ensures that capacitor 113 can be discharged when the start button is open. (The alternative connection for the start button at pin 3 of IC 126 prevents a reset when the scale is switched on and allows a start button to be used which is connected with the platform surface.)

The pulse from diode 115 or 118 is transferred to the set input of flip-flop 126/B. Low-pass filter 141, 142 prevents a reset being triggered by conducted interference. Resistor 119 is used as a pull-down resistor for the set input.

As soon as flip-flop 126/B is set, capacitor 124 is charged via resistor 125. The flip-flop is reset shortly afterwards.

The pulse generated at the output of 126/B switches on the 5V power supply via flip-flop 126/A and transfers a 5V pulse to the controller via resistor 127 and transistor 128.

Low-pass filter 619, 620 ensures that no reset is triggered by conducted interference.

Voltage stabilization
The reset sets flip-flop 126/A whose output sets the shut-down input of switching controller 131 to high. The latter generates a controlled voltage of 5V by means of diode 132, coil 133 and capacitors 129, 130, 134 and 135. By means of the LC combination 136, 137, this voltage is smoothed for use in the A/D converter region.

Using resistors 139 and 140, the control threshold is set above which the switching controller sends a low-batt signal to the controller. Resistor 138 is used as a pull-up resistor here.

If the voltage is to be switched off again, the controller switches the stop signal from high to low. Resistors 121 and 122 as well as transistor 123 perform a level conversion and inversion of the signal, so that a positive edge is given to the clock input of flip-flop 126/A, resetting it and switching off the 5V voltage.

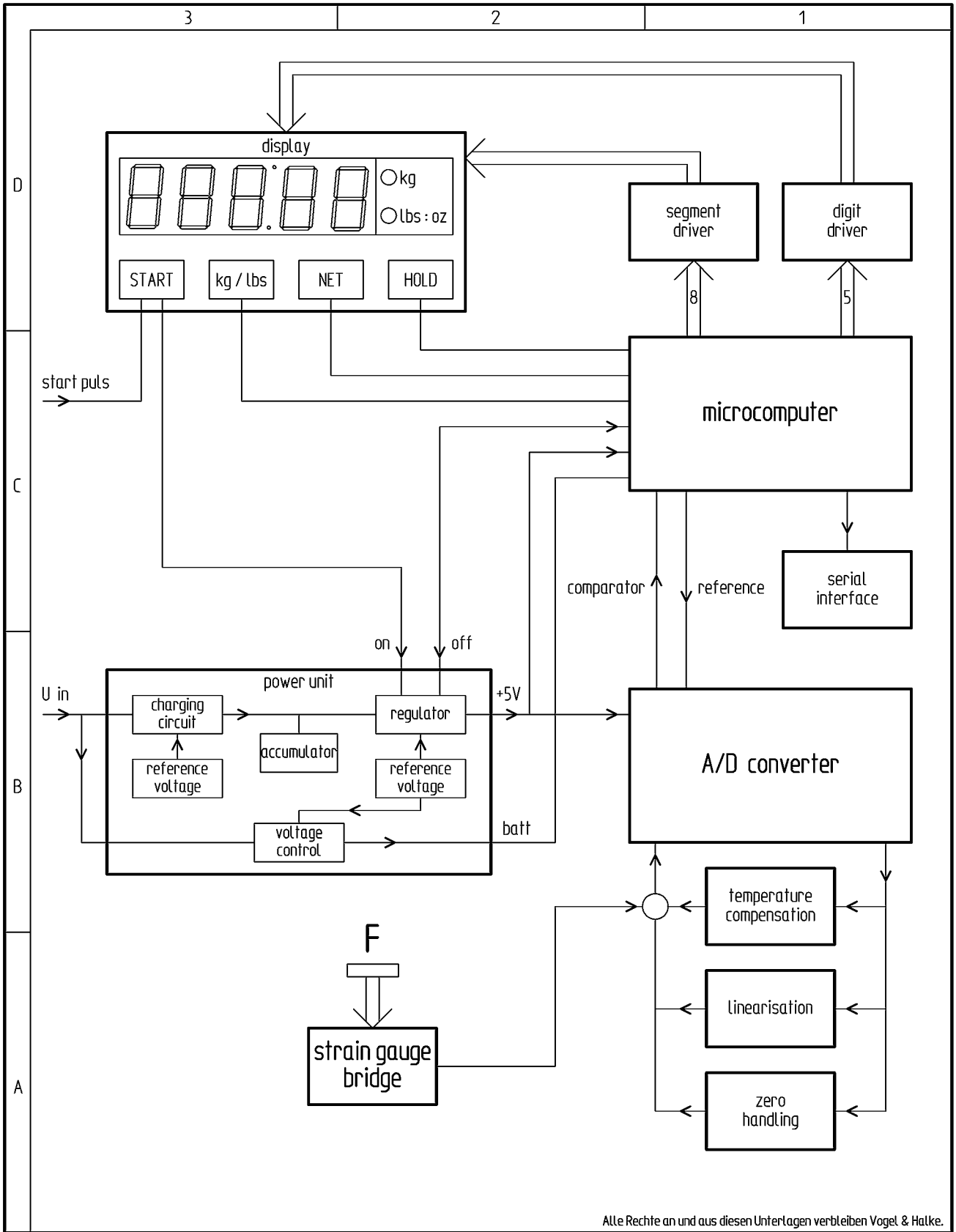
For the seca 717, the 10V in-phase regulator 451 is used which supplies the A/D converter and the force measuring element using buffer capacitors 452, 453.

Battery charging circuit
The rechargeable batteries are charged via stabilized power supply 103, 104, 106, 107, 108 and via diode 105. The charging current corresponds to the float charge current of the batteries. This current is relatively low and increases the charging time, but the service life of the batteries is extended considerably.

Voltage monitoring for the batteries is not necessary. Diode 110 protects the batteries from the unlimited current of the power supply unit.

Diode 102 is used as polarity reversal protection and overvoltage protection. Diodes 110 and 111 protect against discharge during battery operation and against polarity reversal.

Electrolytic and tantalum capacitors are distributed evenly over the printed circuit board as backup capacitors for the operating voltage.



Alle Rechte an und aus diesen Unterlagen verbleiben Vogel & Halke.

Datum/Name:								
Änd.Antrag:								
Index:								
seca HAMBURG	Datum:	03.11.88	Datum/Name:	23.06.97/Aschke	18.07.97/Wint.	05.08.97/Aschke		
	Gezeichnet:	Ely	Änd.Antrag:	%	-	-		
	Geprüft:	Ely	Index:	a	b	c		

Maßstab:	Werkstoff:	Benennung:	Nr.:
		electronics principle	08-09-01-267

Troubleshooting

First and foremost make a visual inspection, checking the soldering points and for corrosion and soiling. Also check that all parts are fitted correctly.

1. Fault description: Rechargeable battery not correctly charged.
Connect the scale to the plug-in power supply unit.

For the correct battery charging current see list 30-34-00-561.

Check the battery charging current.

Remove the rechargeable battery and connect an ammeter to the rechargeable battery connections.

If the charging current is not in the specified range, check the polarity of diode 106 and correct if necessary (anode at input voltage, LED lit when charging current flows).

If the polarity is correct, calibrate the charging current using resistor 103.

If no charging current flows, check transistor 104 and replace if required.

2. Fault description: The scale cannot be started.
When the scale is operated only on rechargeable batteries, make the following check:
Measure the rechargeable battery voltage and recharge the battery if necessary.

When the scale is operated on a plug-in power supply unit make the following check:
The voltage at Z-diode 102 must correspond to the power supply unit voltage.

If the voltage collapses, there is a short-circuit (e.g. in diode 102) or the power supply unit is defective.

Check the 5 V supply voltage:
The voltage at capacitor 518 must be in the range 4.7 V - 5.3 V.

Measure the voltage at pin 6 of IC 131. If it is lower than 6V, replace diode 110 (scale operated on rechargeable batteries) or diode 111 (scale operated with power supply unit).

Measure the voltage at pin 8 of IC 131. If, after pressing the start button, the voltage is lower than 6V, check pin 8 of IC 126 with an oscilloscope. When the start button is pressed, a short positive pulse must be registered. If there is no pulse, check the start button and diodes 115 and 118, otherwise replace IC 126.

Measure the voltage at pin 1 of IC 131. It should be approx. 5V. If this is not the case, check diode 132 and replace if required, otherwise replace IC131.

Check the reset circuit:
Check pin 13 of IC 126 with an oscilloscope. When the start button is pressed, a short positive pulse must be registered. If there is no pulse, replace IC 126.

Check pin 9 of IC 520 with an oscilloscope. If no short positive pulse is measured when the start button is pressed, replace transistor 128, otherwise replace microprocessor IC 520.

Check the microprocessor oscillator:
The frequency measured at pins 18 and 19 of the microprocessor, IC 520, must be 12 MHz.

If this is not the case, replace the quartz.

If the scale still does not work, replace the microprocessor.

3. Fault description: Scale displays “bAtt” after starting”

"bAtt" is triggered if the input voltage falls below approx. 6 V.

When the scale is operated on a plug-in power supply unit make the following check:
The voltage at Z-diode 102 must correspond to the power supply unit voltage.

If the voltage collapses, there is a short-circuit (e.g. in diode 102) or the power supply unit is defective.

When the scale is operated only on rechargeable batteries, i.e. without a power supply unit, make the following check:
On seca 748, the voltage at capacitor 120 must be approx. 9 V, on seca 727 and seca 757 it must be approx. 7.2 V.

If the voltage is different, recharge or replace the rechargeable battery.

4. Fault description: Digit defective

Check the driver transistor (201-205):
At the base of the associated transistor there should be a square-wave signal with an amplitude of approx. 0.7 V and an offset of approx.+4 V.

At the collector of the associated transistor there should be a square-wave signal with an amplitude of approx. 5 V.

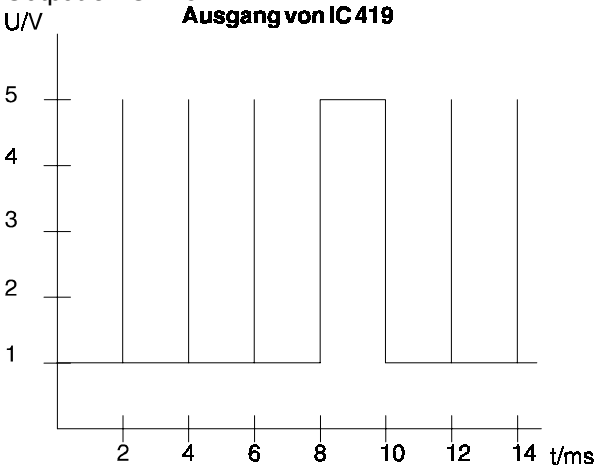
If this is not the case, replace the transistor.

5. Fault description: Segment defective

Check the actuation of the segments with an oscilloscope.

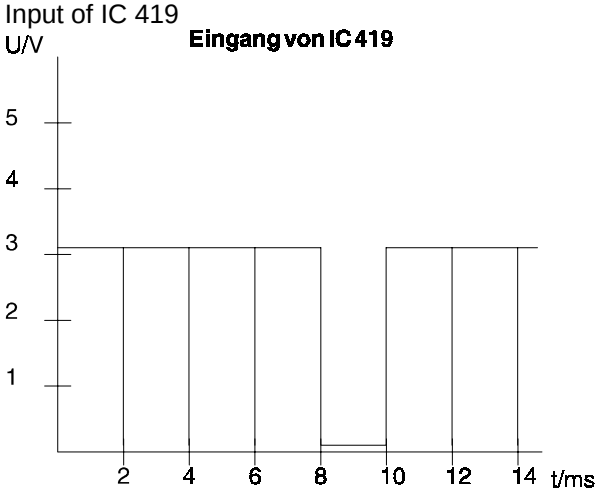
Check the output of IC 419:
To do so, use an oscilloscope connected to the relevant pin to measure the segment actuation signal.

Output of IC 419



If the output does not switch, replace IC 419.
Check the output of microprocessor IC 520 or the input of IC 419:
To do so, use an oscilloscope connected to the relevant pin to measure the segment actuation signal.

Input of IC 419



If the output does not switch, replace the microprocessor.

6. Fault description: Mains operation monitor not working correctly.

If the scale is not loaded, a scale operated on a power supply unit should switch off after 10 minutes.
If operated on rechargeable batteries, the following applies:
seca 717, 727, 728, 737, 757: 1 minute
seca 748: 2 minutes

Check transistor 109:
If the scale is operated on a power supply unit, a voltage of approx. 0.2V must be present at the collector.

If this is not the case, replace transistor 109.

If, when the scale is operated on rechargeable batteries, a voltage of approx. 0.2 V is present at the collector, the wrong transistor was fitted, a PNP instead of an NPN transistor.

If the scale is operated on a power supply unit, a voltage of approx. 0.65 V should be present at the base of transistor 109.

If this is not the case, check whether the correct components have been fitted for LED 106 and resistors 107, 108. Fault description:

7. Fault description: Signal transmitter on model 748 not working.

seca 748: No. 30-34-00-446

To check the microprocessor output, IC 520:
- Start the scale
- A voltage of 5 V must be present at pin 34
- Load the scale with 5 kg and restart it
- " UP " flashes
- Relieve the scale by at least 1 kg
- 0 V must be present at pin 34 for approx. 1 second
- If this is not the case, replace resistor network 519
  or the microprocessor, IC 520.

Check transistor 324:
- A voltage of approx. 0.2 V must be present at the
  collector of transistor 324
- Load the scale with 5 kg and restart it
- " UP " flashes
- Relieve the scale by at least 1kg
- 5 V must be present at the collector of transistor
  324 for approx. 1 second
- If this is not the case, replace transistor 324

Check transistor 325:
- A voltage of approx. 12 V (or 9 V if the scale is operated on rechargeable batteries) must be present at the collector of transistor 325
- Load the scale with 5 kg and restart it
- " UP " flashes
- Relieve the scale by at least 1 kg
- 0.2 V must be present at the collector of transistor
  325 for approx. 1 second
- If this is not the case, replace transistor 325

- If the signal transmitter still does not work, replace
  the signal transmitter

8. Fault description: Scale does not display the correct weight
Check the slope and adjust if necessary, see manual adjustment instructions:
seca 727: No. 30-34-00-448
seca 737/757: No. 30-34-00-484
seca 748: No. 30-34-00-446

9. Fault description: Scale displays "EEEE" after starting
Check fuse 450 or soldering jumper 450 and replace if necessary.

Check the load cell connections on the main board.

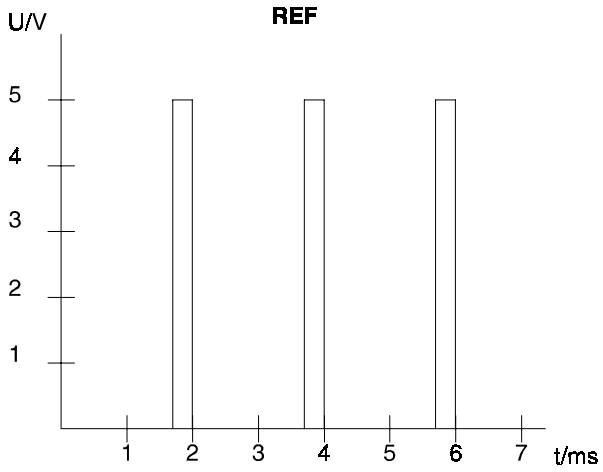
Check the zeropoint and adjust if necessary, see manual adjustment instructions:
seca 727/728: No. 30-34-00-448
seca 717/737/757: No. 30-34-00-484

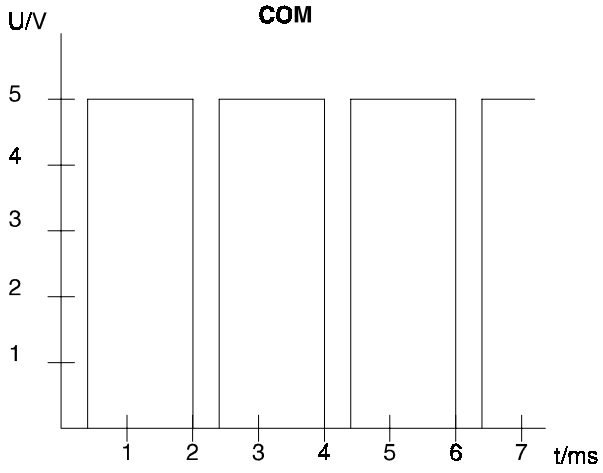
Model 748

Check the cables between the main board and the supplementary board:
- Check the soldered connections
- Measure the signals 5V, GND, REF, TEST on the supplementary board

- Measure the COM signal on the main board
- If a signal is not transmitted, replace the cable

Please refer to the oscillograms below when checking the signals. The pulse widths of the REF and COM signals vary with the load.





Check the force sensor connection:
Check the soldered connections (for seca 748 see drawing 08-06-04-541).

If all cables are okay, there is a fault on the AD converter or the microprocessor is not working properly.

If the supplementary AD converter board on model 748 is replaced, the scale must be calibrated according to calibration instructions 30-34-00-446 and adjustment instructions 30-34-00-487.

Important note: Apply Sylgard 170 A&B to seal the supplementary board

The scale must be recalibrated.

1. Open the scale

1.1 Turn the scale over so that the bottom plate is at the top (diagram 1).

1.2 Slacken the four recessed head screws "A".

1.3 Turn the scale back over again and remove the baby tray. (Diagram 2).

1.4 (Does not apply for model 727/728). Release the recessed head screws "B" on the screening plate. This gives you access to the board.

2. Troubleshooting and replacement work on electronic components

2.1 Depending on the type of fault, refer to Description of faults 30-34-00-437 for troubleshooting.

3. Display electronics

3.1 Pull off the socket connector "C" from the board and from the display electronics.

3.2 Unsolder the cables from the test button and/or the KG/LBS selector switch and from the start switch "D".

3.3 Slacken all the slotted screws "E" on the display and bubble level holder and replace them as a set.

4. <u>Fault on load cell and electronics.</u>

4.1 In this case, the load cell, the bottom plate and the platform support must all be replaced.

5. <u>Assembling the scale.</u>

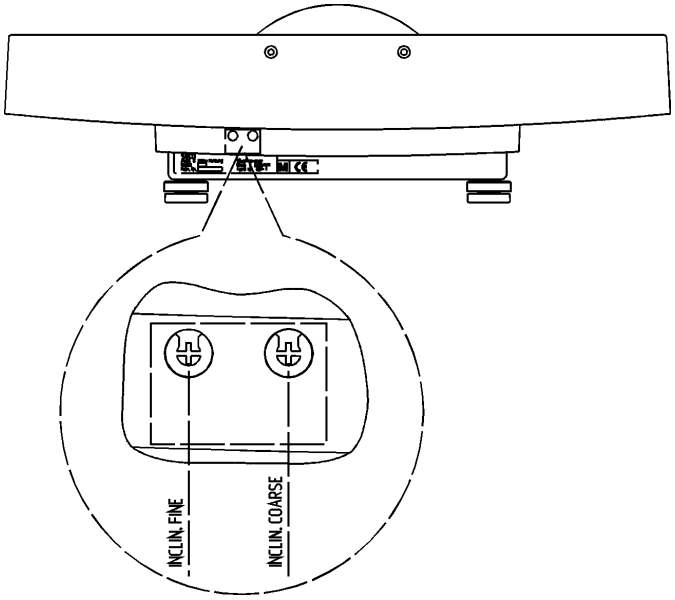
5.1 Assemble the scale in reverse order, following steps 1.1 to 4.1.

5.2 Adjust and check the scale in accordance with the instructions for manual calibration or adjustment.
seca 727/728: 30-34-00-484, 30-34-00-336
seca 717/737/757: 30-34-00-484,30-34-00-488

5.3 Calibrate the scale. (Only applies for model 717/737/757)

Procedure to adjust the scale model 717:

1) Place the scale on a smooth ground and align it by means of a level device. Pay attention that the scale is adapted to the environment temperature prior to the adjustment.



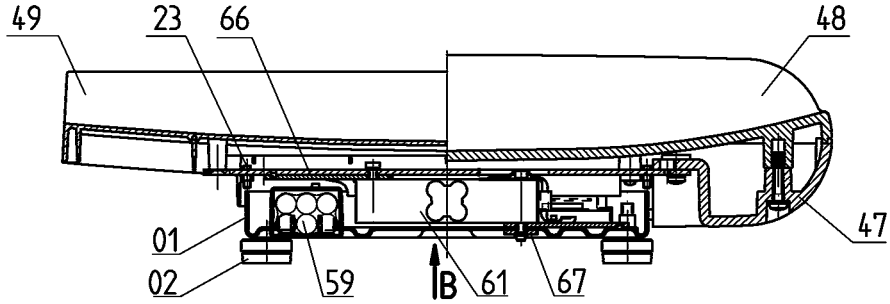
1) Connect the scale with the supply unit to the power supply.
2) Remove the calibration marks at the rear side of the scale, that the rotary potentiometers underneath can be adjusted by means of a screw driver (see sketch).
3) Select a test weight which is nearly max. weight (15 kg) and calculate the set display A_S to be achieved for the test weight P_L, taking into consideration the acceleration due to gravity of the location.
4) Start the scale, wait until 0.0 is displayed and weight it with test weight P_L. Adjust the display coarsly with potentiometer INCLIN.COARSE and finely with potentiometer INCLIN.FINE. Adjust the potentiometers such, that the display of the scale corresponds to the set display A_S.
5) Remove the test weight from the scale and restart it. Weight the scale with the test load and check if the display value corresponds to the set display (tolerance +/- 5 g). If not, repeat steps 5) and 6) described herein.
6) Represent the scale for re-calibration. Take care that the holes for the rotary potentiometers are secured by protection marks against unauthorized use after re-calibration.

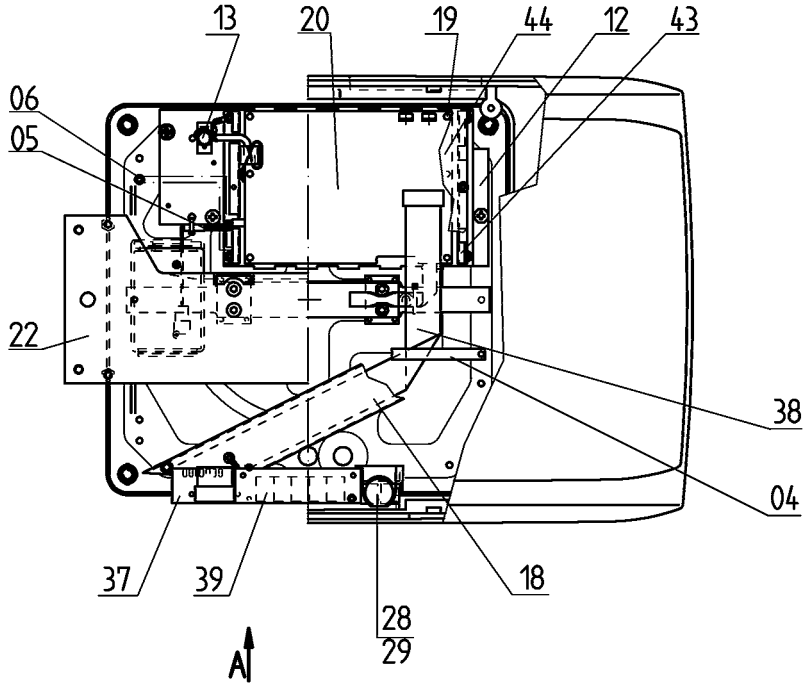
This procedure is suitable for adjusting model 757 too.

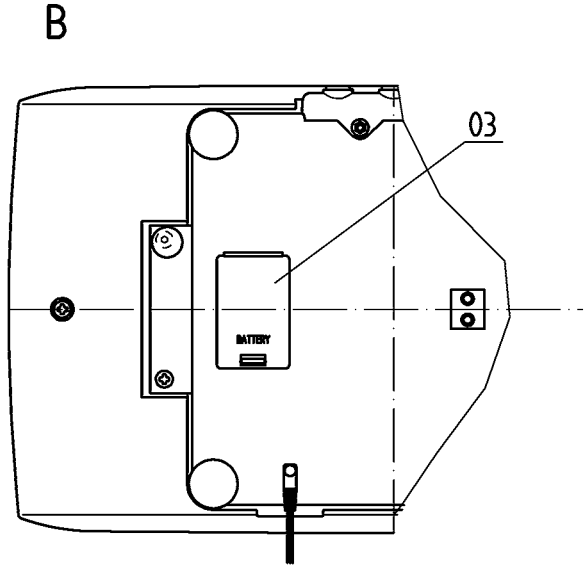
seca 717A, 757

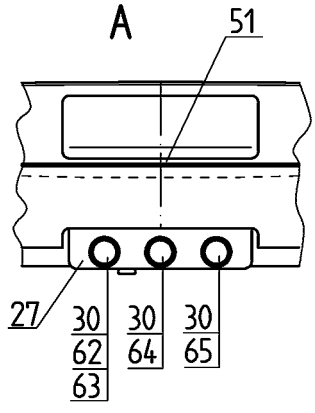
Item	Article no.	Designation	Price stage
01	02-01-01-252-008	Frame black	40
02	01-10-04-007-509	Levelling device	18
03	08-06-14-239-009	Battery compartment	20
04	08-04-05-336-009	PCB holder	04
05	08-06-16-058-119	Cable harness for rechargeable battery connection (model 757 only)	24
06	08-06-16-083-119	Cabel harness for RS 232 interface (model 757 only)	25
12	08-04-05-317-009	Screening plate, bottom	15
13	08-06-16-104-119	Cable harness for mains connection	24
18	08-04-05-346-009	Cable duct (model 717 only)	20
19	66-30-02-030-009	Snap-on spacer	01
20	08-06-18-014-009	Main board	48
	08-06-18-094-009	Main board (model 757 RS 232 only)	49
	08-06-18-014-509	Main board (model 717 japan)	48
22	02-03-01-249-009	Platform support	32
23	50-00-91-330-009	Setscrew DIN 913 - M5x16	01
27	08-04-05-320-009	Support for operating and display elements	20
28	01-17-01-203-009	Bubble level d = 15	15
29	14-05-01-461-009	Bubble level cover	10
30	08-06-16-064-119	Button	10
37	08-06-18-038-009	Display board	35
38	08-06-16-011-119	Cable harness for display board	24
39	01-22-13-223-009	Intermediate plate	15
43	08-04-05-319-009	Screening plate (sides)	10
44	08-04-05-318-009	Screening plate (cover)	10
47	02-03-01-248-008	Bottom part of baby tray (model 757 only)	36
48	02-03-01-230-008	Top part of baby tray (model 757 only)	36

Item	Article no.	Designation	Price stage
49	02-03-01-254-009	Baby tray (model 717 only)	42
51	01-22-13-310-009	Front plate (model 717/717 Japan)	28
	01-22-13-294-009	Front plate (model 757 only)	28
59	68-22-12-721-009	Set of rechargeable batteries Ni-MH 7.2 V /1100 mAh (model 757 only)	33
61	08-06-12-067-009	Platform load cell	48
62	01-18-01-260-009	Push-button, with print, 5g-2g (model 717 only)	08
63	01-18-01-254-009	Push-button, with print, NET (model 757 only)	08
64	01-18-01-255-009	Pushbutton, with print, ON	08
65	01-18-01-256-009	Pushbutton, with print, HOLD	08
66	08-04-02-208-009	Mounting plate (load cell)	15
67	01-03-01-031-009	Pressure plate with Presti nut	15
(68)	01-09-04-011-009	Transport locking device, compl.	18
(69)	68-32-10-252-009	plug in power supply unit 230V/50Hz (mod. 717/757)	32
	68-32-10-261-009	plug in power supply unit 12V/150mA(mod. 717 Japan)	32


49
23
66
48
01
02
59
B
61
67
47


13
20
19
44
12
43
06
05
22
38
04
37
39
18
28
29
A


B
03
BATTERY


A
51
27
30
62
63
30
64
30
65